

Harness Design and Sizing: Challenges and Solutions

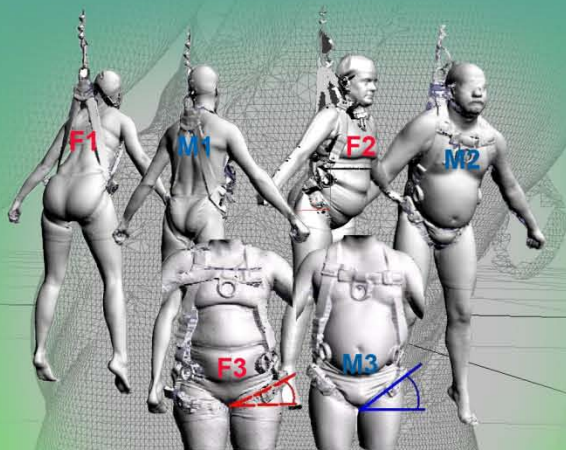
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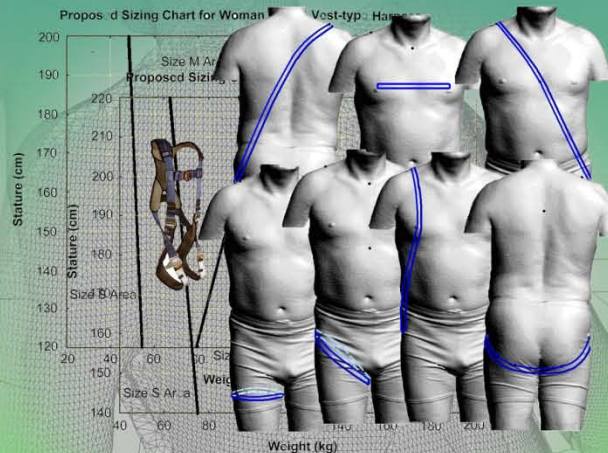
INTRODUCTION: Updated harness design for fall protection is needed to accommodate a wider range of body sizes and weights as well as an increased participation by female workers in the current construction workforce.

METHODS (1): Using the most current 3D whole-body digital scanning technology and body-shape quantification methods, NIOSH has conducted a series of studies to establish an improved fall-arrest harness design and sizing system.

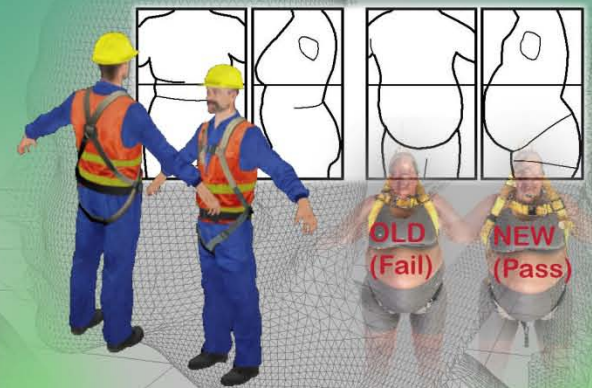
METHODS (2): These studies examined human-harness interfaces, quantified body shapes, and established equations for predicting the best-fit harness size. The equations were applied to a national data-base of body scans to determine the number of harness sizes.



RESULTS (1): Women have demonstrated a flatter thigh strap angle than men (F3 vs. M3), which is correlated to fit failure. In addition, increased torso suspension angle (hence fit failure) is associated with a reduction in torso length and a more developed chest (F1 vs. M1). Interference of chest strap to neck is associated with soft thigh compositions (F2 vs. M2).



RESULTS (2): The study outcomes suggested an improved sizing scheme containing 3 sizes for women and 3 sizes for men in lieu of the current 4- to 7-size unisex systems. The sizing chart for each gender as well as cut lengths and adjustment ranges for each harness strap were proposed.



IMPACT: This research provides both scientific theories and practical design and test criteria to advance harness configurations to reduce the risk of worker injury that results from poor user fit, improper size selection, or the failure to don the harness properly. The harness industry is using the results to formulate the next generation harness designs for diverse populations.